IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/627,206
Appellant	:	Harry Israel Ringermacher et al.
Filed	:	July 24, 2003
Title	:	INFRARED THERMOGRAPHY IMAGING SYSTEM WITH ACTIVELY QUENCHED LAMP
TC/A.U.	:	2855
Conf. No:	:	4236
Examiner	:	Gail Kaplan Verbitsky
Docket No.	:	120631-1

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Alexandria, VA 22313-1450

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal submitted on March 24, 2009.

Appellant previously paid a $510 fee to submit an Appeal Brief on August 25, 2008, and the previously paid fee is applicable to the submission of the present Appeal Brief. The Commissioner is authorized to charge the $30.00 difference between the current fee ($540.00) and the previously paid fee ($510.00), and any additional fees, which may be necessary to advance prosecution of the present application, to Account No. 07-0868.

1. REAL PARTY IN INTEREST

The real party in interest is General Electric Company, the Assignee of the above-referenced application by virtue of the Assignment to General Electric Company by Harry Israel Ringermacher, Richard S. Zhang and Robert John Filkins. Accordingly, General Electric Company will be directly affected by the Board's decision in the pending appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellant's legal representative in this Appeal.

3. STATUS OF CLAIMS

Claims 1-14, 23-27 and 29 are cancelled in this application. Claims 15-22, 28 and 30 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal.

4. STATUS OF AMENDMENTS

No amendments were filed after the rejection dated November 26, 2008.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to the field of infrared ("IR") thermography and, more particularly, to actively controlling the flash duration of an IR lamp for an IR thermography imaging system. See, Application page 1, paragraph 1.

The Application contains two pending independent Claims, 15 and 30, which are directed to IR thermography imaging systems. The subject matter of these independent claims is summarized below.

Discussions of the recited features of Claim 15 can be found in at least the following cited locations of the specification. By way of example, Figure 1 illustrates an actively quenched lamp embodiment of the invention, in block form, and Figure 9 illustrates an infrared thermography imaging system embodiment of the invention. Claim 15 is directed to an IR thermography imaging system 10 comprising at least one flash lamp 12 configured to heat a

surface 42 of an object 40 to be imaged. (See Application, page 4, paragraph 21.) At least one active quenching means 14 is provided and configured to quench the at least one flash lamp 12 to control a duration of a flash. (See Application, page 4, paragraph 21.) The active quenching means 14 is configured to receive a control signal T2 and to quench the flash lamp 12 in response to the control signal T2. (See Application, page 5, paragraph 23 and Figures 2 and 3.) The IR thermography imaging system 10 further includes a timing generator 22 configured to supply the control signal T2. (See application, page 5, paragraph 24 and Figure 1.) The IR thermography imaging system 10 further includes an IR camera 32 configured to capture a number of IR image frames of the object 40. (See Application, page 8, paragraph 31.)

Discussions of the recited features of Claim 30 can be found in at least the following cited locations of the specification. By way of example, Figure 3 shows an example of an active quenching means, in block form. Claim 30 is directed to an IR thermography imaging system 30 comprising at least one flash lamp 12 configured to heat a surface 42 of an object 40 to be imaged. (See Application, page 4, paragraph 21 and Figure 9.) At least one active quenching means 14 is provided and is configured to quench the at least one flash lamp 12 to control a duration of a flash. (See Application, page 4, paragraph 21 and Figure 9.) The active quenching means 14 is configured to receive a control signal T2 and to quench the flash lamp 12 in response to the control signal T2. (See Application, page 5, paragraph 23 and Figures 2 and 3.) The IR thermography imaging system 30 further includes a timing generator 22 configured to supply the control signal T2. (See application, page 8, paragraph 34 and Figure 9.) The IR thermography imaging system 30 further includes an IR camera 32 configured to capture a number of IR image frames of the object 40. (See Application, page 8, paragraph 31.) The active quenching means is a switch 13 that opens in response to the control signal T2. (See Application, page 6, paragraph 28 and Figure 3.)

By way of example, an exemplary timing diagram for an actively quenched lamp 10 is shown in Figure 2. For the example illustrated in Figures 1 and 2, the active quenching means 14 receives an initial control signal T0 supplied by the timing generator 22 and allows current I to flow to the lamp 12 in response to the initial control signal T0. (See Application, page 5,

paragraph 23.) As noted above, the active quenching means 14 receives a control signal T2 and quenches the lamp 12 in response to the control signal T2. (See Application, page 5, paragraph 23.) As indicated in Figure 3, for example, exemplary control signals T2 and T0 are the high and low portions, respectively, of a pulse signal. (See Application, page 5, paragraph 23.)

Benefits of the invention, as described in the specification, include active control of the duration of a flash for IR thermography, such that the desired flash duration may be selected for a given application. As shown in Figure 2 by the dashed line, without quenching, the flash has an exponential tail. This exponential tail would continue to heat the object during data acquisition, thereby distorting the thermal information in the data frames. A quenched flash is shown by the solid line. As shown in Figure 2, the flash has a duration D of about D=T2-T1. The desired duration D varies by application and is long enough to heat the surface of the object being inspected but short enough to end prior to acquisition of the data frames. Beneficially, by cutting off the exponential tail (shown by the dashed line in Figure 2), the active quenching means 14 reduces distortion of the thermal information in the data frames. In turn, reducing the distortion of the thermal information in the data frames permits a more accurate analysis. (See Application, page 6, paragraph 25 and Figure 2.)

This is a clear difference and distinction from the prior art, as discussed below.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellant respectfully urges the Board to review and reverse the Examiner's first ground of rejection in which Claims 15-20 and 30 were rejected under 35 U.S.C. § 103 (a) over an article titled FRONT-FLASH THERMAL IMAGING CHARACTERIZATION OF CONTINUOUS FIBER CERAMIC COMPOSITES (Deemer), in view of US Patent No. 3,675,074 (Dennewitz).

Second Ground of Rejection for Review on Appeal:

Appellant respectfully urges the Board to review and reverse the Examiner's second ground of rejection in which Claims 21, 22 and 28 were rejected under 35 USC § 103(a) over Deemer, in view of Dennewitz, in further view of "Integrated Gate-Commutated Thyristors: A

New Approach to High Power Electronics," Eric Carroll et al., IGCT Press Conference, May 20, 1997.

7. ARGUMENT

As discussed in detail below, Claims 15-22, 28 and 30 define allowable subject matter over the cited art. Accordingly, Appellant respectfully requests full and favorable consideration by the Board.

A. Ground of Rejection No. 1:

The Examiner rejected Claims 15-20 and 30 under 35 U.S.C. 103 (a) over an article titled FRONT-FLASH THERMAL IMAGING CHARACTERIZATION OF CONTINUOUS FIBER CERAMIC COMPOSITES (Deemer), in view of US Patent No. 3,675,074 (Dennewitz).

1. Legal basis required to establish a *prima facie* case of obviousness.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). To establish a *prima facie* case, the Examiner must not only show that the combination includes all of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). Slipping into use of hindsight and reading into the prior art the teachings of the invention at issue are to be avoided. *Graham v. John Deere Co. of Kan. City*., 383 U.S. 1, 36 (1966).

2. Claims 15-20 and 30 define allowable subject matter over Deemer, in view of Dennewitz.

Appellant respectfully submits that the cited art lacks sufficient features to render Appellant's claimed subject matter obvious under 35 U.S.C. § 103.

"Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill

in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined." *Graham*, 383 U.S. 1, 17 (1966).

Claim 15 is directed to an infrared thermography imaging system that includes at least one **active** quenching means configured to quench at least one flash lamp to control the duration of a flash. The active quenching means is configured to receive a control signal T2 and to quench the flash lamp in response to the control signal T2. The infrared thermography imaging system further includes **a timing generator configured to supply the control signal T2**, and an IR camera configured to capture IR image frames of the object.

Timing generators are discussed, for example in paragraph [0022]. As discussed in paragraph [0027], Figures 5-8 demonstrate **active** quenching collateral with the applied gate pulse. As discussed in paragraph [0025], the flash has a duration D of about D=T2-T1, where T2 is the control signal supplied by the timing generator and T1 is the lamp trigger signal T1, where the timing generator is optionally further configured to supply the lamp trigger signal T1. In this manner, the quenching can be controlled with the applied gate-pulse, as shown for example in Figures 5-8.

In support of the rejection of Claim 15, the Examiner cites Deemer as disclosing an infrared thermography imaging system. As noted by the Examiner, Deemer does not teach or suggest an active quenching means configured to quench at least one flash lamp to control the duration of a flash, as recited by Claim 15. Further, Appellant submits that the Examiner has not motivated the proposed combination. Although, the Examiner asserts that Demer "teaches to cool the flash by actively shutting it off" (page 5 of the November 26, 2008 Office Action), the Examiner did not point to any specific portion of Deemer to support this assertion, and **Appellant could find nothing in Deemer that would support the Examiner's assertion.**

To supply these deficiencies of Deemer, the Examiner cites Dennewitz. However, Dennewitz does not teach or suggest **a timing generator** configured to supply the control signal T2. **Instead, the duration-control in Dennewitz is determined by the reflection time for the return signal from the illuminated object.** In particular, Dennewitz uses a photosensitive element 12 to detect a portion of the light reflected from an object 11 illuminated by the flash

tube 1. This detected light portion is integrated to form a control signal, which is coupled to a second input 18 of the comparator circuit 16. The gate 4 is disabled and the flash terminated after a lapse of time sufficient to permit the control voltage to exceed the reference voltage. (Abstract) Thus, in contrast to the present **active** quenching scheme, the quench time in Dennewitz is determined by the reflection time for the light reflected from the illuminated object. Namely, the quench time is **fixed** based on the reflection time for the light reflected from the illuminated object.

The flash duration control scheme of Dennewitz is discussed in greater detail in Col. 3, lines 41-58, which provides:

> During the interval that the flash tube 1 emits light, the resistance of the photosensitive resistor 12 is lowered sufficiently, in a well-known manner, by the influence of the light reflected from the object 11, to charge the capacitor 13 from the voltage source represented by the potential across the resistor 5. As a result, the control voltage builds up across the capacitor 13. When the flash duration has persisted for a time long enough so that the control voltage at the input terminal 18 is equal to the reference voltage at the input terminal 17, the comparator circuit 16 again assumes its second state. The Schmitt trigger 19 will therefore again be reversed to apply a negative disabling voltage to the base electrode 13A of the gate 4. The resulting closure of the gate 4 stops the discharge of the flash capacitor 6 through the tube 1, and the latter ceases to emit light energy. The resulting cutoff of the tube 1 also disables the energizing voltage generated across the resistor 5 for exciting the photosensitive resistor 12.

Accordingly, the duration of the flash is set by the reflection time for the return signal. Thus, Dennewitz does not employ **active** quenching means but rather relies on a **passive** quenching scheme, **where the duration is passively controlled based on the reflection time for the return signal.** Accordingly, Claim 15 is not a mere combination of pre-existing elements disclosed in Deemer and Dennewitz, but rather the active quenching control scheme of Claim 15 creates a completely new synergy, namely, control of flash duration independent of the flash itself.

Thus, because neither Deemer nor Dennewitz disclose **a timing generator** generating a signal T2 that **actively** quenches the lamp, no combination of the two references would render the subject matter of Claim 15 obvious in their light.

Regarding the Examiner's comments on page 5 of the November 26, 2009 Office Action regarding the meaning of the phrase "active quenching," Appellant respectfully submits that her interpretation, namely that any lamp which turns on and off could be considered "actively" quenched, is inconsistent with both the language of Claim 15, which recites **a timing generator configured to supply the control signal T2,** and the discussion of active quenching in the Specification. See for example, Figures 5-8, which demonstrate active quenching collateral with the applied gate pulse. As discussed in paragraph [0025], the flash has a duration D of about D=T2-T1, where T2 is the control signal supplied by the timing generator and T1 is the lamp trigger signal T1, where the timing generator is optionally further configured to supply the lamp trigger signal T1. In this manner, **the quenching can be controlled with the applied gate-pulse,** as shown for example in Figures 5-8, **and thus is active**. In contrast, Dennewitz employs a **passive** flash duration control scheme, in which the duration is determined by the reflection time for the light reflected from the illuminated object. As stated in paragraph [0007] of the present application, **active control of the duration of the flash permits the selection of the desired flash duration for a given application.** In contrast, the passive flash duration control scheme of Dennewitz has only one flash duration for a given application, which is determined by the reflection time for the return signal.

Regarding the Examiner's assertion on page 5 of the November 26, 2008 Office Action, that "the entire system that controls duration in Dennewitz is a timing generator because it does the same function that the timing generator claimed by Applicant," Appellant submits that the Examiner's statement is inconsistent: with the language of Claim 15, with the use of the phrase "timing generator" in the Specification, and with the standard usage of "timing generator" by those skilled in the art. In claim 15, the timing **generator** is configured **to supply** the control signal T2. The Specification teaches that the desired flash duration D=T2-T1 varies by application (paragraph [0025]) and the FIGS. 5-7 show example flashes cut off at 20 ms, 10 ms

and 2 ms. Thus, one skilled in the art would understand that the timing generator is not a passive timing scheme, as employed by Dennewitz, but rather is configured to supply select control signals T2, to achieve selected flash durations (for example, as illustrated in FIGS. 5-7). In contrast, the passive timing scheme employed in Dennewitz would not be able to achieve different flash durations, for a given set-up.

In addition, Appellant wishes to address the Examiner's assertion on page 5 of the Office Action, that the combinations of elements of Dennewitz **including transistors** controls duration. To the extent the Examiner is insinuating by means of this statement that Dennewitz employs active quenching means, Appellant respectfully directs the attention of the Board to the Abstract and to the above cited portion (Col. 3, lines 41-58) of Dennewitz which clearly show that Dennewitz employs a passive flash duration control scheme, in which the duration is determined by the reflection time for the light reflected from the illuminated object.

Thus, Appellant respectfully submits that the cited art does not teach or suggest all of the claim limitations of Claim 15. Claims 16-20 depend from Claim 15. Accordingly, a prima facie case of obviousness has not been established for Claims 15-20, and Appellant requests that the Board overturn the rejection and allow Claims 15-20.

Turning to claim 30, Appellant respectfully submits that substantially analogous arguments to those supporting Claim 15 apply to Claim 30 and that that the cited art does not teach or suggest all of the claim limitations of Claim 30. Accordingly, a prima facie case of obviousness has not been established for Claim 30, and Appellant requests that the Board overturn the rejection and allow Claim 30.

B. <u>Ground of Rejection No. 2</u>:

The Examiner rejected Claims 21-22 and 28 under 35 U.S.C. 103 (a) over Deemer and Dennewitz, further in view of an article titled INTEGRATED GATE-COMMUNICATED THYRISTORS (Carroll).

1. <u>Claims 21, 22 and 28 define allowable subject matter over Deemer, in view of Dennewitz, further in view of Carroll.</u>

Claims 21, 22 and 28 depend indirectly from Claim 15. As discussed above, Deemer and Dennewitz do not establish a prima facie case of obviousness for independent Claim 15. The Examiner has cited Caroll for teachings regarding power semiconductor switches. However, Caroll does not supply the above-discussed deficiencies of Deemer and Dennewitz.

As such, Appellant respectfully submits that the cited art does not teach or suggest all of the claim limitations of Claims 21, 22 and 28. Accordingly, a prima facie case of obviousness has not been established for Claims 21, 22 and 28, and Appellant requests that the Board overturn the rejections and allow Claims 21, 22 and 28.

8. Conclusion

Appellant respectfully submits that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned legal representative at the telephone number indicated below.

Respectfully submitted,

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9. APPENDIX OF CLAIMS ON APPEAL

Listing of Claims:

15. An infrared ("IR") thermography imaging system comprising:

at least one flash lamp configured to heat a surface of an object to be imaged;

at least one active quenching means configured to quench said at least one flash lamp to control a duration of a flash, wherein said active quenching means is configured to receive a control signal T2 and to quench said flash lamp in response to the control signal T2;

a timing generator configured to supply the control signal T2; and

an IR camera configured to capture a plurality of IR image frames of the object.

16. The IR thermography imaging system of Claim 15, wherein said active quenching means is further configured to receive an initial control signal T0, wherein said active quenching means is further configured to allow a current flow I to said flash lamp in response to the initial control signal T0, and wherein the timing generator is further configured to supply the initial control signal T0.

17. The IR thermography imaging system of Claim 16, wherein said active quenching means comprises a switch, wherein said switch closes in response to the initial control signal T0 and opens in response to the control signal T2.

18. The IR thermography imaging system of Claim 17, wherein the timing generator is further configured to supply a lamp trigger signal T1, and wherein said flash lamp is activated in response to the lamp trigger signal T1.

19. The IR thermography imaging system of Claim 16, wherein said active quenching means further comprises a switch drive circuit configured to receive a logic level signal and to generate a switch-drive signal in response, wherein the control signal T2 is a logic level signal, and wherein said high-voltage, high current switch opens in response to the switch-drive signal that corresponds to the control signal T2.

20. The IR thermography imaging system of Claim 19, wherein the switch-drive signal is a switch-drive voltage signal.

21. The IR thermography imaging system of Claim 17, wherein said switch comprises a power semiconductor switch.

22. The IR thermography imaging system of Claim 17, wherein said switch comprises an insulated gate bipolar transistor.

28. The IR thermography imaging system of Claim 21, wherein the power semiconductor switch is selected from the group consisting of a silicon controlled rectifier, a gate turn-on thryristor, a MOSFET, a insulated gate commutated thyristor ("IGCT"), and combinations thereof.

30. An infrared ("IR") thermography imaging system comprising:

at least one flash lamp configured to heat a surface of an object to be imaged;

at least one active quenching means configured to quench said at least one flash lamp to control a duration of a flash, wherein said active quenching means is configured to receive a control signal T2 and to quench said flash lamp in response to the control signal T2

a timing generator configured to supply the control signal T2; and

an IR camera configured to capture a plurality of IR image frames of the object,

wherein said active quenching means is a switch, wherein said switch opens in response to the control signal T2.

10. APPENDIX OF EVIDENCE

None

11. <u>APPENDIX OF RELATED PROCEEDINGS</u>

None.